

procure and maintain fine breeds of cattle and so forth, which are costly, but repay in satisfaction.

There is yet another existing form of princely benevolence which might be so extended as to exercise a large effect on race improvement. I mean the provision to exceptionally promising young couples of healthy and convenient houses at low rentals. A continually renewed settlement of this kind can be easily imagined, free from the taint of patronage, and analogous to colleges with their self-elected fellowships and rooms for residence, that should become an exceedingly desirable residence for a specified time. It would be so in the same way that a good club by its own social advantages attracts desirable candidates. The tone of the place would be higher than elsewhere, on account of the high quality of the inmates, and it would be distinguished by an air of energy, intelligence, health and self-respect and by mutual helpfulness.

Prospects.—It is pleasant to contrive Utopias, and I have indulged in many, of which a great society is one, publishing intelligence and memoirs, holding yearly elections, administering large funds, establishing personal relations like a missionary society with its missionaries, keeping elaborate registers and discussing them statistically with honest precision. But the first and pressing point is to thoroughly justify any crusade at all in favour of race improvement. More is wanted in the way of unbiased scientific inquiry along the many roads I have hurried over, to make every stepping-stone safe and secure, and to make it certain that the game is really worth the candle. All I dare hope to effect by this lecture is to prove that in seeking for the improvement of the race we aim at what is apparently possible to accomplish, and that we are justified in following every path in a resolute and hopeful spirit that seems to lead towards that end. The magnitude of the inquiry is enormous, but its object is one of the highest man can accomplish. The faculties of future generations will necessarily be distributed according to laws of heredity, whose statistical effects are no longer vague, for they are measured and expressed in formulæ. We cannot doubt the existence of a great power ready to hand and capable of being directed with vast benefit as soon as we shall have learnt to understand and to apply it. To no nation is a high human breed more necessary than to our own, for we plant our stock all over the world and lay the foundation of the dispositions and capacities of future millions of the human race.

OCEAN CIRCULATION.¹

THE investigation carried on by Mr. H. N. Dickson into the distribution of temperature and salinity in the surface water of the North Atlantic is one of great importance. It promises, if continued, to be of considerable value, not only to those who are especially interested in studying the circulation of the surface water of the Ocean, but also to meteorologists generally and particularly to those who see, in a comparison of the varying yearly temperatures of the North Atlantic with that of a mean for the season, the key to a clearer knowledge of the causes which combine to influence the climate of western Europe, and especially of our Islands, and who look hopefully in that direction for information whereby future modifications in the conditions of climate may be foretold for periods some time in advance.

The treatise before us, setting forth the author's method of conducting the research and the results at which he arrived, was contributed to the Royal Society in March, 1900.

In introducing his subject the author says: "The history of our knowledge of the currents of the North Atlantic Ocean up to the year 1870 has been written once for all by Petermann," whom he quotes at some length, remarking "that the conclusions, then arrived at, were not modified by the observations of the next twenty years."

During the years 1896 and 1897 materials were collected for preparing the charts of temperature and salinity, the parallel of 40° N. being selected as the southern boundary of the area for investigation. The observations of temperature were furnished by the Meteorological Office, the Danish Meteorological Department, the United States Hydrographical Department, and the Bureau Central Météorologique de France, and by Prof. Pettersson. The samples of water for the determination of salinity were obtained from the captains of vessels keeping logs

for the Meteorological Office and for the Danish Hydrographical Department, specially made bottles being supplied to them for the purpose, and no care being spared in guarding against impurity or the introduction of any matter that could give rise to error in the analytical determinations.

The accuracy of the method adopted in estimating the salinity of the samples was subjected to severe scrutiny. The author states the results of his observations, demonstrating the distribution of temperature and salinity for each month during the year 1896 as shown in the charts prepared by him, in which the isotherms and isohalines are supplemented by a scale of colouring denoting areas having the same range of temperature and the same range of salinity. He calls attention to the general agreement between the distribution of salinity as shown on the one set of charts and that of temperature as shown on the other set when apparent, and notes departures and irregularities when they occur. He then deals in the same manner with the observations of 1897 and compares results.

Taking the means of each month respectively for the two years, the distribution of temperature, as shown on these charts, corresponds fairly well with the distribution of sea-surface temperature given on the quarterly sea-temperature charts on the North Atlantic, issued by the Meteorological Office in 1884.

For the purpose of defining the limits of ocean currents and of arriving at some estimate as to its relative velocity in different localities, the information to be gained by the thermometer is invaluable, for over areas little frequented by shipping where current observations are necessarily sparse, a comparatively insignificant number of sea-surface observations will suffice to indicate the existence or failure of an ocean stream; and if to these detective signs be added observations of salinity, the evidence acquired becomes still more complete.

The effects of the cold water from the north in deflecting the warm stream from the westward are clearly shown on these charts, which, when seasonal variation in temperature has been made allowance for, appear in good agreement (speaking generally) with the monthly current charts of the North Atlantic, published by the Admiralty, as regards the area over which the warm water of the Gulf Stream is distributed each month, and the northern and western limits to which it reaches. The indications of the existence of Gulf Stream water, stated roughly, may be traced on the Admiralty Chart to the following limits in the given months:—

January.—The stream does not reach to the eastward of 20° W., and a south-easterly set is apparent off Ireland.

February.—In 55° N. it reaches 15° W.; a south-easterly set is found to the westward of Ireland, and a south-westerly to the south-westward of the Fastnet Rock.

March.—It has advanced to the coast of Ireland.

April.—In 55° N. its limit has receded to 20° W., and the Iceland south-going current begins to show itself north of 55° N.

May.—The Gulf Stream and Davies Strait cold current mingle in 47° N. 27° W., the Iceland current sets S. and S.W. to 48° N. 30° W.

June.—Gulf Stream to 15° W. in 52° N. Iceland and Denmark Strait cold currents to Irish coast.

July.—To the S. of 50° N. it joins the Iceland and Denmark Strait current in about 48° N. off the Bay of Biscay.

August.—It extends to the north of Ireland but is modified in about 20° W. by a south-going set.

September.—It extends to the north of Scotland.

October.—It is found in 10° W. in 59° N.

November.—The data are insufficient, but the Stream is traceable to 19° W. in 59° N.

December.—It is difficult to trace the Stream eastward of 40° N. in 45° W. A south-going cold current is shown to the north-westward and westward of Ireland; there is a persistent southerly (S.E. to S.W.) movement of water in the eastern half of the Atlantic.

Mr. Dickson's charts show the existence of Gulf Stream water to the northward and westward of the limits given above for several months, notably on the January chart, and the explanation doubtless is that the value of the current being small, it has been inappreciable in navigation.

There exists, during the greater part of the year, a movement of water eastward, which divides, at a varying distance to the westward of the English Channel. One arm branches towards the Bay of Biscay, the other northward (Rennell's Current). The latter is well known to the captains of the large

¹ *Phil. Trans.* of the Royal Society:—"The Circulation of the Surface Waters of the North Atlantic Ocean." By H. N. Dickson.

Transatlantic liners, who are accustomed to make allowance for it when shaping their course to sight the Fastnet. This current is well shown on the author's temperature charts for several months.

In dealing with the question of causation, the author summarises as follows: "The general circulation of the North Atlantic is therefore the result of a large number of factors, each of which is subject to wide variation. From a consideration of the mean results in its relation to the mean atmospheric circulation, it appears that the oceanic circulation is directly controlled by the winds, the form, position and intensity of the whole Atlantic anticyclone and of the cyclonic area to the north of it being taken into account. The movements of water set up directly by these systems are modified by, firstly and chiefly, the configuration of the land, and, secondly, by the effects of melting ice." And again: "The key to the position seems to be the Atlantic anticyclone which controls the low-pressure areas, both directly and indirectly, by its far-reaching effect on the oceanic circulation; and it seems scarcely likely that the causes modifying this system are confined to the Atlantic, even if they are to be found at the surface at all."

It would be regrettable if this work, so ably and successfully inaugurated, should be dropped.

Mr. Dickson mentions that it can be efficiently carried on for the sum of 300*l.* annually, and we are of opinion that the cost might be even less, for on board of almost all large liners the temperature of the sea surface is recorded at intervals of four hours with regularity, and on many, observations for specific gravity also; the rough method by which the latter is obtained is, we admit, unsatisfactory, as the hydrometer is difficult to read when subject to the least movement, but these records are better than none. In the interests of navigation alone this investigation should be continued.

It is noteworthy that, at the present time, there are many navigators who, in some measure, utilise observations of sea-surface temperature, and the time is not, we hope, far distant when the sea-surface thermometer and hydrometer may be recognised generally, as aids in determining to some extent changes in the direction and strength of ocean currents, and as affording the seaman an additional safeguard against miscalculation when approaching land in thick weather.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Natural science scholarships are announced for competition at Balliol, Christchurch and Trinity on December 3. at Magdalen on December 10, at Jesus on January 14.

Dr. J. S. Haldane, lecturer in physiology, has been elected to a fellowship at New College.

Dr. G. C. Bourne has been re-appointed lecturer in comparative anatomy for a period of three years.

Mr. O. J. R. Howarth, of Christ Church, has been elected to the geographical scholarship.

The celebration of the tercentenary of Bodley's Library will take place in October, 1902, and a delegacy of twelve will shortly be appointed to undertake the necessary arrangements.

The 227th meeting of the Oxford University Junior Scientific Club was held (Wednesday, October 23) at the Museum. The principal business of the evening was a paper by H. S. Souttar, of Queen's College, entitled "The Atom, an Electromagnetic Theory of Matter." The principal officers of the Club for this term are:—president, A. C. le Rossignol, Exeter; treasurer, E. L. Kennaway, New College; chemical secretary, E. Walls, Corpus; biological secretary, E. Burstal, Trinity; Boyle Lecture treasurer, S. A. Ionides, Balliol; editor, H. D. Davis, Balliol; members of committee, J. G. Priestley, Christ Church; Rev. G. D. Allen, non-collegiate.

CAMBRIDGE:—Mr. H. Lamb, Trinity, Mr. J. Larmor, St. John's, Mr. H. W. Richmond, King's, and Mr. E. T. Whittaker, Trinity, have been appointed examiners for the Mathematical Tripos, part 2, to be held in 1902.

Mr. W. T. N. Spivey, of Trinity College, died on October 22 from septic pneumonia following a lamentable accident which happened to him in the University Chemical Laboratory a fortnight before. Mr. Spivey was engaged in research work and was shaking two volatile and explosive liquids in a flask when

an explosion occurred and he was seriously cut and burned. The sad death of this promising young chemist is much regretted.

DR. R. THAXTER has been appointed professor of cryptogamic botany at Harvard University.

At a meeting of the Royal University of Ireland held on Friday last, the degree of D.Sc. was conferred upon Prof. W. N. Hartley, F.R.S.

A NEW Hall of Natural History is to be erected in connection with Syracuse University at the expense of an anonymous donor.

MR. F. E. REES, lecturer in physics at the Storey Institute, Lancaster, has been appointed to the lectureship and demonstratorship of physics at the University College of North Wales, Bangor.

Science states that Milliken University, Decatur, Ill., will be opened next year with an endowment of more than a million dollars, half of which sum has been given by Mr. James Milliken. Prof. S. R. Taylor, late of the Kansas State Normal School, has been appointed the president.

ADDITIONAL examiners in mathematics, chemistry, zoology, materia medica and therapeutics, medicine and clinical medicine, surgery and clinical surgery will shortly be appointed by the University of Glasgow. Applications for the appointments must be lodged on or before December 3 next.

A CIRCULAR just issued by the Board of Education describes the principles which are being followed with regard to making grants to schools and classes conducted by School Boards under the provisions of the new Education Act. When the local Authority has given a general sanction to the work of an existing school, the school is eligible for grants upon subjects taught in the twelve months preceding the passing of the Act. Extensions of the curriculum, or of the work of a school by including pupils of an age or sex not previously admitted, will not be recognised unless the specific sanction of the Local Authority has been furnished to the Board of Education.

ACCORDING to *Science*, the attendance at Cornell University, including 850 new students, is about 250 in excess of that of last year. Inclusive of the medical school in New York and the summer school at Ithaca, the total registration for the year is between 3250 and 3500. The registration on the campus, of students in regular courses, promises to be about 2750. Sibley College has a total attendance of new students, in all classes and courses, of above 350, almost equal to the total of upper classmen returning to the college, making the probable total registration for 1901-2 about 750 in all grades. The College of Civil Engineering has increased fifty per cent., and the other colleges and departments report large additions.

THE Hon. T. Jefferson Coolidge, of Boston, has given more than 50,000 dollars to the Jefferson Physical Laboratory of Harvard University to further physical research. In the terms of the gift he states that:—"The income of this fund shall be used primarily for laboratory expenses of original investigations by members of the laboratory staff. But the Director, at his discretion, may award therefrom an honorarium, of not more than five hundred dollars per annum, for the private use of any person who—although receiving no salary from the University—may wish to carry on original investigations under his directions at the Jefferson Laboratory. The results of such investigations shall appertain to the Laboratory, and the name of the Laboratory shall accompany the investigation; but no publication shall be made without the approval of the Director. The balance of this income is to be used only for meeting the legitimate expenditures of original investigations whether by professors or students."

IN introducing Mr. James Stuart, the Lord Rector of St. Andrews University, to the gathering held at Dundee on Friday, October 25, Lord Balfour of Burleigh, the newly-elected Chancellor of the University, remarked that it was said that trade was being taken away from the country, that German chemistry had deprived Britain of the indigo trade, that we had to go to other countries for our goods, and that, generally speaking, trade in this country was in a bad way. The British manufacturer depended upon old methods, while the German employed newer. It was their business to help the manufacturers of this country to put an end to this. What was wanted in Dundee was a greater